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COMPOSITION OF APOLLO 17 CORE 76001; RANDY L. KOROTEV and KAYLYNN M. BISHOP, Department of Earth & Planetary Sciences, Washington Univ., St. Louis, MO.

Core 76001 is a single drive tube containing a column of regolith taken at the base of the North Massif, station 6, Apollo 17 (Fig. 1). The core material is believed to have accumulated through slow downslope mass wasting from the massif [1,2,3]. As a consequence, the core soil is mature throughout its length [2]. Results of INAA for samples taken every half centimeter along the length of the core indicate that there is only minor systematic compositional variation with depth (Figs. 2,3). Concentrations of elements primarily associated with mare basalt (Sc, Fe) and noritic impact melt breccia (Sm) [4,5] decrease slightly with depth, particularly between 20 cm and the bottom of the core at ~32 cm depth. This is consistent with petrographic studies that indicate a greater proportion of basalt and melt breccia in the top part of the core [3]. However, Sm/Sc and La/Sm ratios are remarkably constant with depth, indicating no variation in the ratio of mare material to Sm-rich highlands material with depth. Other than these subtle changes, there is no compositional evidence for the two stratigraphic units (0-20 cm and 20-32 cm) defined on the basis of modal petrography [3], although all samples with anomalously high Ni concentrations (Fe-Ni metal nuggets) occur above 20 cm depth (Fig. 3b).

All surface and trench soils from station 6 are very similar to each other in composition, but those samples collected on (76321) or near (76241, 76261, 76281) boulders tend to be richer in ITEs (incompatible trace elements) such as Sm than samples collected away from boulders (76031, 76221, 76501) (Figs. 1,4). This is because noritic melt breccia, which is the principal carrier of ITEs at the site, is a principal component of the boulders, and these soils contain a large component of material derived from the boulders ("blocks" of Fig. 4). Core 76001 was collected several meters from a boulder and, on average, it is compositionally indistinguishable from surface and trench soils also collected away from boulders. The Sc- and Sm-poor soil at the bottom of the core, however, is poorer in ITEs than any of the surface and trench soils from station 6 or any other part of the site. In terms of the mixing model used to account for compositional variation in Apollo 17 soils [4], the low-Sm soil at the bottom of 76001 has the greatest ratio of anorthositic norite (gabbro) component to noritic melt breccia component of any known Apollo 17 soil.

The slight compositional variation within the core leads to a weak correlation between Sm and Sc concentrations (Fig. 4; $R^2 = 0.37$, or 0.49 if the two high-Sc samples are excluded; these samples probably contain large fragments of mare basalt). A linear trend on a 2-element plot of related lunar soil samples usually represents a binary mixing relationship, either between a soil and a rock lithology or between two soils. For the 76001 samples, the identity of the two mixing components is not obvious. In the high-Sm direction the trend does not extrapolate toward any of the lithologic components of the site, but instead to a point between the fields for mare basalt and noritic melt breccia. As noted above, the ratio of these two components remains constant throughout the core. Similarly, extrapolation of the trend in the low-Sm direction also does not intersect the field of any single station-6 lithology [6]. Thus, if the trend represents a mixing line, both components must be soils. In the high-Sm direction the trend extrapolates to soil 76131 from LRV stop 10 ("Turning Point Rock"). This soil has the highest concentrations of ITEs among soils from the North Massif area and may represent an end-member composition.

As is typically seen in small samples of lunar soil, a few individual samples (each 120 mg in mass) have anomalously high concentrations of Ni that are accompanied by high concentrations of FeO (total Fe as FeO; Fig. 3) as well as Ir and Au (not shown). These usually result from 'nuggets' of Fe-Ni metal of meteoritic origin, or possibly fragments of chondrites. However, the sample at 8 cm depth is anomalously enriched in Fe and Co with respect to Cr, Ni, Ir, and Au. This probably reflects contamination with a fragment of terrestrial metal. The uppermost two samples are clearly contaminated with Au (Fig. 3d). The low Au/Ni ratios of Fig. 3d, e.g., at 8 and 24 cm depth, are highly imprecise as a result of low absolute concentrations of Au (<1 ng/g).

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